

§ 572.188

section, the lumbar spine-headform assembly shall meet performance requirements specified in paragraph (c) of this section.

(b) *Test procedure.* (1) Soak the lumbar spine-headform assembly in a test environment as specified in § 572.189(n);

(2) Attach the lumbar spine-headform assembly to the Part 572 pendulum test fixture per procedure in § 572.183(b)(2) and as shown in Figure U2-A in appendix A to this subpart. Torque the lumbar hex nut (p/n 9000057) on to the lumbar cable assembly (175-5506) to 50 ± 5 in-lb;

(3) Release the pendulum from a height sufficient to allow it to fall freely to achieve an impact velocity of 6.05 ± 0.1 m/s measured at the center of the pendulum accelerometer (Figure 22) at the time the pendulum makes contact with its decelerating mechanism. The velocity-time history of the pendulum falls inside the corridor determined by the upper and lower boundaries specified in Table 1 to paragraph (b) of this section;

(4) Allow the lumbar spine to flex without the lumbar spine or the headform making contact with any object;

(5) Time zero is defined in § 572.189(j).

TABLE 1 TO PARAGRAPH (b)—ES-2RE LUMBAR SPINE CERTIFICATION PENDULUM VELOCITY CORRIDOR

Upper boundary		Lower boundary	
Time (ms)	Velocity (m/s)	Time (ms)	Velocity (m/s)
1.0	0.00	0.0	-0.05
3.7	-0.24	2.7	-0.425
27.0	-5.80	24.5	-6.50
		30.0	-6.50

(c) *Performance criteria.* (1) The pendulum deceleration pulse is to be characterized in terms of decrease in velocity as determined by integrating the filtered pendulum acceleration response from time-zero.

(2) The maximum rotation in the lateral direction of the reference plane of the headform (175-9000) as shown in Figure U2-B in appendix A to this subpart, shall be 45 to 55 degrees with respect to the longitudinal axis of the pendulum occurring between 39 and 53 ms from time zero. Rotation of the headform-neck assembly shall be meas-

49 CFR Ch. V (10-1-11 Edition)

ured with potentiometers specified in § 572.189(c), installed as shown in drawing 175-9000, and calculated per procedure specified in Figure U2-B in appendix A to this subpart.

(3) The decaying headform rotation vs. time curve shall cross the zero angle with respect to its initial position at impact relative to the pendulum centerline between 37 ms to 57 ms after the time the peak translation-rotation value is reached.

[71 FR 75331, Dec. 14, 2006, as amended at 73 FR 33921, June 16, 2008]

§ 572.188 Pelvis.

(a) The pelvis (175-6000) is part of the torso assembly shown in drawing 175-0000. The pelvis is equipped with a pubic symphysis load sensor in conformance with § 572.189(f) and mounted as shown in drawing (175-0000 sheet 4). When subjected to tests procedures specified in paragraph (b) of this section, the pelvis assembly shall meet performance requirements specified in paragraph (c) of this section.

(b) *Test procedure.*

(1) Soak the dummy assembly (175-0000) without suit (175-8000) and shoulder foam pad (175-3010) as specified in § 572.189(n);

(2) The dummy is seated as specified in Figure U6 in appendix A to this subpart;

(3) The pelvis impactor is the same as specified in § 572.189(a);

(4) The impactor is guided, if needed, so that at contact with the pelvis its longitudinal axis is within ± 0.5 degrees of a horizontal plane and perpendicular to the midsagittal plane of the dummy and the centerpoint on the impactor's face is within 5 mm of the center of the H-point in the pelvis, as shown in Figure U6 in appendix A to this subpart;

(5) The impactor impacts the dummy's pelvis at 4.3 ± 0.1 m/s.

(6) Time zero is defined in § 572.189(k).

(c) *Performance criteria.* (1) The impactor force (probe acceleration multiplied by its mass) shall be not less than 4,700 N and not more than 5,400 N, occurring between 11.8 ms and 16.1 ms from time zero;

(2) The pubic symphysis load, measured with load cell specified in § 572.189(f) shall be not less than 1,230 N

and not more than 1,590 N occurring between 12.2 ms and 17.0 ms from time zero.

[71 FR 75331, Dec. 14, 2006, as amended at 73 FR 33921, June 16, 2008]

§572.189 Instrumentation and test conditions.

(a) The test probe for lateral shoulder, thorax without arm, abdomen, and pelvis impact tests is the same as that specified in §572.36(a) and the impact probe has a minimum mass moment of inertia in yaw of 9,000 kg-cm², a free air resonant frequency not less than 1,000 Hz and the probe's end opposite to the impact face has provisions to mount an accelerometer with its sensitive axis collinear with the longitudinal axis of the probe. All hardware attached directly to the impactor and one-third (1/3) of the mass of the suspension cables must be included in the calculations of the total impactor mass. The sum mass of the attachments and 1/3 cable mass must not exceed 5 percent of the total pendulum mass. No suspension hardware, suspension cables, or any other attachments to the test probe, including velocity vane, shall make contact with the dummy during the test.

(b) Accelerometers for the head, the thoracic spine, and the pelvis conform to specifications of SA572-S4.

(c) Rotary potentiometer for the neck and lumbar spine certification tests conforms to SA572-53.

(d) Linear position transducer for the thoracic rib conforms to SA572-S69.

(e) Load sensors for the abdomen conform to specifications of SA572-S75.

(f) Load sensor for the pubic symphysis conforms to specifications of SA572-77.

(g) Load sensor for the lumbar spine conforms to specifications of SA572-76.

(h) Instrumentation and sensors conform to the Recommended Practice SAE J-211 (Mar. 1995)—Instrumentation for Impact Test unless noted otherwise.

(i) All instrumented response signal measurements shall be treated to the following specifications:

(1) Head acceleration—Digitally filtered CFC 1000;

(2) Neck and lumbar spine rotations—Digitally filtered CFC 180;

(3) Neck and lumbar spine pendulum accelerations—Digitally filtered CFC 60;

(4) Pelvis, shoulder, thorax without arm, and abdomen impactor accelerations—Digitally filtered CFC 180;

(5) Abdominal and pubic symphysis force—Digitally filtered at CFC 600;

(6) Thorax deflection—Digitally filtered CFC 180.

(j)(1) Filter the pendulum acceleration data using a SAE J211 CFC 60 filter.

(2) Determine the time when the filtered pendulum accelerometer data first crosses the -10 g level (T_{10}).

(3) Calculate time-zero: $T_0 = T_{10} - T_m$,
Where:

$T_m = 1.417$ ms for the Neck Test
= 1.588 ms for the Lumbar Spine Test

(4) Set the data time-zero to the sample number nearest to the calculated T_0 .

(k)(1) Filter the pendulum acceleration data using a SAE J211 CFC 180 filter.

(2) Determine the time when the filtered pendulum accelerometer data first crosses the -1.0 m/s² (-.102 g) acceleration level (T_0).

(3) Set the data time-zero to the sample number of the new T_0 .

(l) Mountings for the head, spine and pelvis accelerometers shall have no resonance frequency within a range of 3 times the frequency range of the applicable channel class.

(m) Limb joints of the test dummy are set at the force between 1 to 2 G's, which just supports the limb's weight when the limbs are extended horizontally forward. The force required to move a limb segment does not exceed 2 G's throughout the range of the limb motion.

(n) Performance tests are conducted, unless specified otherwise, at any temperature from 20.6 to 22.2 degrees C. (69 to 72 degrees F.) and at any relative humidity from 10 percent to 70 percent after exposure of the dummy to those conditions for a period of not less than 4 hours.

(o) Certification tests of the same component, segment, assembly, or fully assembled dummy shall be separated in time by a period of not less than thirty (30) minutes unless otherwise specified.